

**IN THE CLAIMS**

Please amend the claims as follows.

1-131. (Cancelled).

132. (Previously Presented) A compound that is a substrate of a cytochrome P450 enzyme and a pro-substrate of a luciferase enzyme, wherein the compound is a structural analog of luciferin, dehydroluciferin or luciferol that includes a substitution at the 6' hydroxy site of luciferin or luciferol or the corresponding 6' site of dehydroluciferin, which substitution includes

C<sub>1-20</sub> alkoxy or C<sub>1-20</sub> alkenyloxy wherein the alkoxy and alkenyloxy are substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl; or

C<sub>3-20</sub> alkynyloxy; cycloalkoxy, cycloalkylamino, C<sub>1-20</sub> alkylamino, diC<sub>1-20</sub> alkylamino, C<sub>2-20</sub> alkenylamino, diC<sub>2-20</sub> alkenylamino, C<sub>2-20</sub> alkenyl C<sub>1-20</sub>alkylamino, C<sub>3-20</sub> alkynylamino, diC<sub>3-20</sub> alkynylamino, C<sub>3-20</sub> alkynyl C<sub>1-20</sub>alkylamino, or C<sub>3-20</sub> alkynyl C<sub>2-20</sub>alkenylamino, wherein each of the above groups are optionally substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl.

133. (Currently Amended) A composition comprising a compound ~~the D-luciferin derivative~~ of claim 132.

134. (Original) The composition of claim 133, further comprising a pyrophosphatase.

135. (Cancelled).

136. (Cancelled).

137. (Original) A compound selected from the group consisting of  
luciferin 6' 2-chloroethyl ether;  
luciferin 6' benzyl ether

luciferin 6' 4-picolinyl ether;  
luciferin 6' 4-trifluoromethylbenzyl ether;  
luciferin 6' phenylethyl ether  
luciferin 6' geranyl ether  
luciferin 6' prenyl ether  
luciferin 6' 2-picolinyl ether; and  
luciferin 6' 3-picolinyl ether.

138. (Original) The compound according to claim 137 selected from the group consisting of

luciferin 6' benzyl ether;  
luciferin 6' phenylethyl ether;  
luciferin 6' geranyl ether; and  
luciferin 6' prenyl ether.

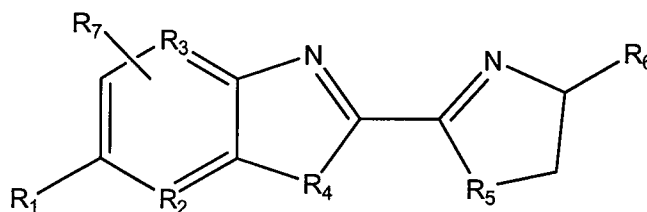
139. (Currently Amended) The compound according to ~~claim 136~~ claim 137 selected from the group consisting of

luciferin 6' 2-chloroethyl ether;  
luciferin 6' 4-picolinyl ether;  
luciferin 6' 4-trifluoromethylbenzyl ether;  
luciferin 6' 2-picolinyl ether; and  
luciferin 6' 3-picolinyl ether.

140-167. (Cancelled)

168. (Previously Presented) The composition according to claim 134 wherein the pyrophosphatase is an inorganic pyrophosphatase.

169. (Previously Presented) A compound having the formula:



wherein

R<sub>1</sub> represents hydrogen, hydroxy, C<sub>1-20</sub> alkoxy or C<sub>1-20</sub> alkenyloxy, wherein the alkoxy and alkenyloxy are substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl; or

R<sub>1</sub> represents C<sub>3-20</sub> alkynyloxy; cycloalkoxy, cycloalkylamino, C<sub>1-20</sub> alkylamino, diC<sub>1-20</sub> alkylamino, C<sub>2-20</sub> alkenylamino, diC<sub>2-20</sub> alkenylamino, C<sub>2-20</sub> alkenyl C<sub>1-20</sub>alkylamino, C<sub>3-20</sub> alkynylamino, diC<sub>3-20</sub> alkynylamino, C<sub>3-20</sub> alkynyl C<sub>1-20</sub>alkylamino, or C<sub>3-20</sub> alkynyl C<sub>2-20</sub>alkenylamino, wherein each of the above groups are optionally substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl;

R<sub>2</sub> and R<sub>3</sub> independently represent C or N;

R<sub>4</sub> and R<sub>5</sub> independently represent S, O, NR<sub>8</sub> wherein R<sub>8</sub> represents hydrogen or C<sub>1-20</sub> alkyl, or CR<sub>9</sub>R<sub>10</sub> wherein R<sub>9</sub> and R<sub>10</sub> independently represent H, C<sub>1-20</sub> alkyl or fluorine;

R<sub>6</sub> represents CH<sub>2</sub>OH; COR<sub>11</sub> wherein R<sub>11</sub> represents hydrogen, hydroxy, C<sub>2-20</sub> alkenyl, or -OM<sup>+</sup> wherein M<sup>+</sup> is an alkali metal or a pharmaceutically acceptable salt; and

R<sub>7</sub> represents hydrogen, C<sub>1-6</sub> alkyl, C<sub>2-20</sub> alkenyl, halogen or C<sub>1-6</sub> alkoxy; provided that when R<sub>1</sub> is hydroxy, R<sub>7</sub> is not hydrogen, R<sub>11</sub> is not hydroxy, R<sub>2</sub> and R<sub>3</sub> are not both carbon, and R<sub>4</sub> and R<sub>5</sub> are not both S (luciferin);

when R<sub>1</sub> is hydrogen, R<sub>7</sub> is not hydrogen, R<sub>11</sub> is not hydroxy, R<sub>2</sub> and R<sub>3</sub> are not both carbon, and R<sub>4</sub> and R<sub>5</sub> are not both S (dehydroluciferin); and

when R<sub>1</sub> is hydroxy, R<sub>7</sub> is not hydrogen, R<sub>6</sub> is not CH<sub>2</sub>OH, R<sub>2</sub> and R<sub>3</sub> are not both carbon, and R<sub>4</sub> and R<sub>5</sub> are not both S (luciferol).

170. (New) A composition comprising a compound of claim 169.

171. (New) The composition of claim 170, further comprising a pyrophosphatase.

172. (New) The composition according to claim 171 wherein the pyrophosphatase is an inorganic pyrophosphatase.

173. (New) The compound according to claim 169 selected from the group consisting of

luciferin 6' 2-chloroethyl ether;  
luciferin 6' 4-picolinyl ether;  
luciferin 6' 4-trifluoromethylbenzyl ether;  
luciferin 6' 2-picolinyl ether; or  
luciferin 6' 3-picolinyl ether.

174. (New) A composition comprising a compound of claim 173.

175. (New) The composition of claim 174, further comprising a pyrophosphatase.

176. (New) The composition according to claim 175 wherein the pyrophosphatase is an inorganic pyrophosphatase.

177. (New) The compound according to claim 169 selected from the group consisting of

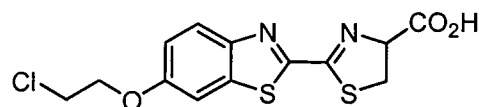
luciferin 6' benzyl ether;  
luciferin 6' phenylethyl ether;  
luciferin 6' geranyl ether; and  
luciferin 6' prenyl ether.

178. (New) A composition comprising a compound of claim 177.

179. (New) The composition of claim 178, further comprising a pyrophosphatase.

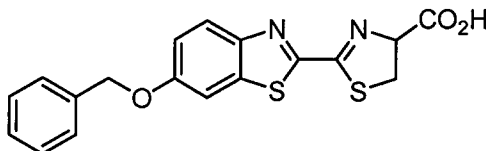
180. (New) The composition according to claim 179 wherein the pyrophosphatase is an inorganic pyrophosphatase.

181. (New) The compound according to claim 169 that has the structure



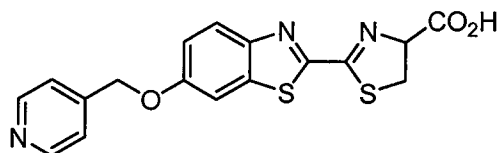
or a salt thereof.

182. (New) The compound according to claim 169 that has the structure



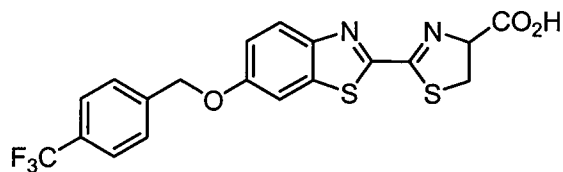
or a salt thereof.

183. (New) The compound according to claim 169 that has the structure



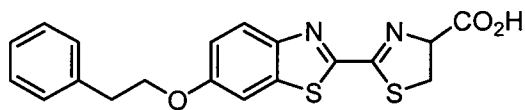
or a salt thereof.

184. (New) The compound according to claim 169 that has the structure



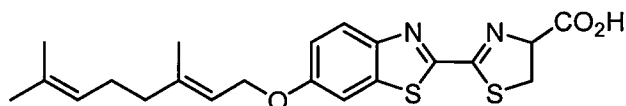
or a salt thereof.

185. (New) The compound according to claim 169 that has the structure



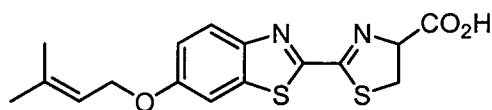
or a salt thereof.

186. (New) The compound according to claim 169 that has the structure



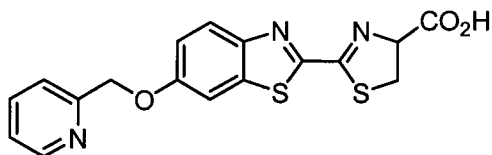
or a salt thereof,

187. (New) The compound according to claim 169 that has the structure



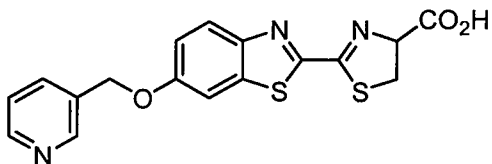
or a salt thereof.

188. (New) The compound according to claim 169 that has the structure



or a salt thereof.

189. (New) The compound according to claim 169 that has the structure



or a salt thereof.

190. (New) A kit for determining the effect of a substance on cytochrome P450 enzyme activity comprising:

(a) one or more luminogenic compounds wherein the compound is a cytochrome P450 enzyme substrate and a pro-substrate of luciferase enzyme, wherein the compound is a structural analog of luciferin, dehydroluciferin or luciferol that includes a substitution at the 6' hydroxy site of luciferin or luciferol or the corresponding 6' site of dehydroluciferin, which substitution includes

C<sub>1-20</sub> alkoxy or C<sub>1-20</sub> alkenyloxy wherein the alkoxy and alkenyloxy are substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl; or

C<sub>3-20</sub> alkynyloxy; cycloalkoxy, cycloalkylamino, C<sub>1-20</sub> alkylamino, diC<sub>1-20</sub> alkylamino, C<sub>2-20</sub> alkenylamino, diC<sub>2-20</sub> alkenylamino, C<sub>2-20</sub> alkenyl C<sub>1-20</sub>alkylamino, C<sub>3-20</sub> alkynylamino, diC<sub>3-20</sub> alkynylamino, C<sub>3-20</sub> alkynyl C<sub>1-20</sub>alkylamino, or C<sub>3-20</sub> alkynyl C<sub>2-20</sub>alkenylamino, wherein each of the above groups are optionally substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl; and

(b) directions for using the kit.

191. (New) The kit according to claim 190, further comprising one or more bioluminescent enzymes.

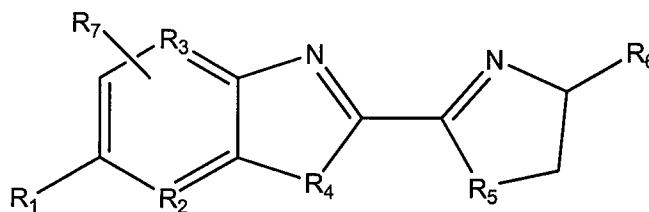
192. (New) The kit according to claim 191 wherein the bioluminescent enzyme is a luciferase.

193. (New) The kit according to claim 191 wherein the bioluminescent enzyme is a firefly or a Renilla luciferase.

194. (New) The kit according to claim 190 further comprising ATP and magnesium ions.

195. (New) The kit according to claim 194 further comprising a detergent.

196. (New) The kit according to claim 195 wherein the detergent is non-ionic.
197. (New) The kit according to claim 195 further comprising a pyrophosphatase.
198. (New) The kit according to claim 197 wherein the pyrophosphatase is an inorganic pyrophosphatase.
199. (New) The kit according to claim 198 wherein the compound has the formula:



wherein

R<sub>1</sub> represents hydrogen, hydroxy, C<sub>1-20</sub> alkoxy or C<sub>1-20</sub> alkenyloxy, wherein the alkoxy and alkenyloxy are substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl; or

R<sub>1</sub> represents C<sub>3-20</sub> alkynyloxy; cycloalkoxy, cycloalkylamino, C<sub>1-20</sub> alkylamino, diC<sub>1-20</sub> alkylamino, C<sub>2-20</sub> alkenylamino, diC<sub>2-20</sub> alkenylamino, C<sub>2-20</sub> alkenyl C<sub>1-20</sub>alkylamino, C<sub>3-20</sub> alkynylamino, diC<sub>3-20</sub> alkynylamino, C<sub>3-20</sub> alkynyl C<sub>1-20</sub>alkylamino, or C<sub>3-20</sub> alkynyl C<sub>2-20</sub>alkenylamino, wherein each of the above groups are optionally substituted with halogen, hydroxy, amino, cyano, azido, heteroaryl or aryl substituted with haloalkyl;

R<sub>2</sub> and R<sub>3</sub> independently represent C or N;

R<sub>4</sub> and R<sub>5</sub> independently represent S, O, NR<sub>8</sub> wherein R<sub>8</sub> represents hydrogen or C<sub>1-20</sub> alkyl, or CR<sub>9</sub>R<sub>10</sub> wherein R<sub>9</sub> and R<sub>10</sub> independently represent H, C<sub>1-20</sub> alkyl or fluorine;

R<sub>6</sub> represents CH<sub>2</sub>OH; COR<sub>11</sub> wherein R<sub>11</sub> represents hydrogen, hydroxy, C<sub>2-20</sub> alkenyl, or -OM<sup>+</sup> wherein M<sup>+</sup> is an alkali metal or a pharmaceutically acceptable salt; and

R<sub>7</sub> represents hydrogen, C<sub>1-6</sub> alkyl, C<sub>2-20</sub> alkenyl, halogen or C<sub>1-6</sub> alkoxy; provided that when R<sub>1</sub> is hydroxy, R<sub>7</sub> is not hydrogen, R<sub>11</sub> is not hydroxy, R<sub>2</sub> and R<sub>3</sub> are not both carbon, and R<sub>4</sub> and R<sub>5</sub> are not both S (luciferin);



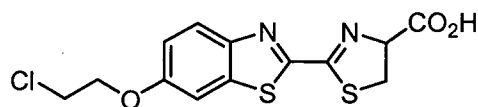
when  $R_1$  is hydrogen,  $R_7$  is not hydrogen,  $R_{11}$  is not hydroxy,  $R_2$  and  $R_3$  are not both carbon, and  $R_4$  and  $R_5$  are not both S (dehydroluciferin); and

when  $R_1$  is hydroxy,  $R_7$  is not hydrogen,  $R_6$  is not  $\text{CH}_2\text{OH}$ ,  $R_2$  and  $R_3$  are not both carbon, and  $R_4$  and  $R_5$  are not both S (luciferol).

200. (New) The kit according to claim 190, further comprising a reversible luciferase inhibitor.

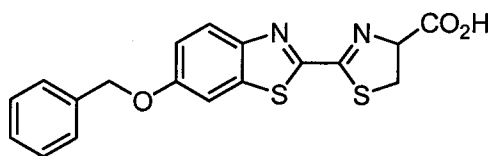
201. (New) The kit according to claim 200, wherein the reversible luciferase inhibitor is 2-(4-aminophenyl)-6-methylbenzothiazole (APMBT) or 2-amino-4-methylbenzothiazole (AMBT).

202. (New) The kit according to claim 190 wherein the compound has the structure



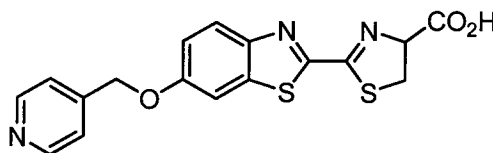
or a salt thereof.

203. (New) The kit according to claim 190 wherein the compound has the structure



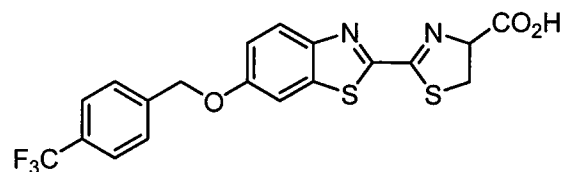
or a salt thereof.

204. (New) The kit according to claim 190 wherein the compound has the structure



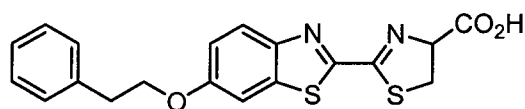
or a salt thereof.

205. (New) The kit according to claim 190 wherein the compound has the structure



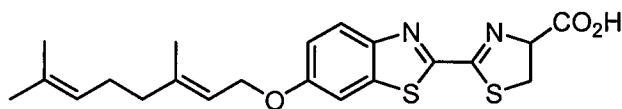
or a salt thereof.

206. (New) The kit according to claim 190 wherein the compound has the structure



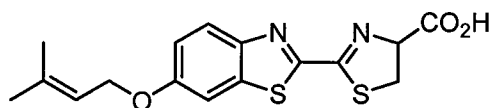
or a salt thereof.

207. (New) The kit according to claim 190 wherein the compound has the structure



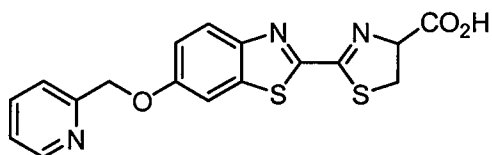
or a salt thereof.

208. (New) The kit according to claim 190 wherein the compound has the structure



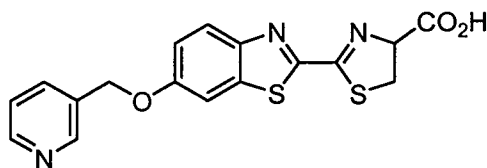
or a salt thereof.

209. (New) The kit according to claim 190 wherein the compound has the structure



or a salt thereof.

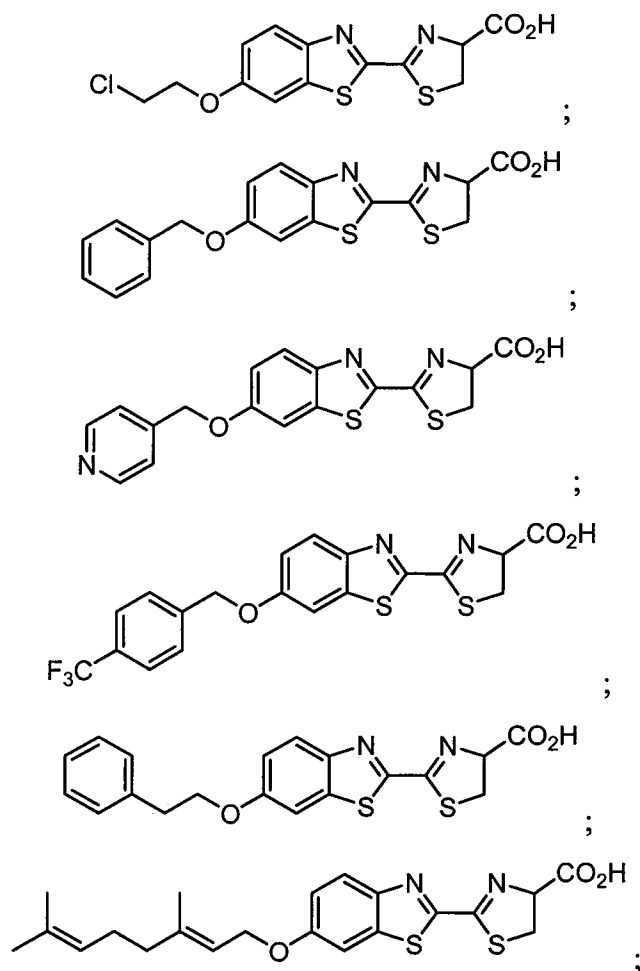
210. (New) The kit according to claim 190 wherein the compound has the structure

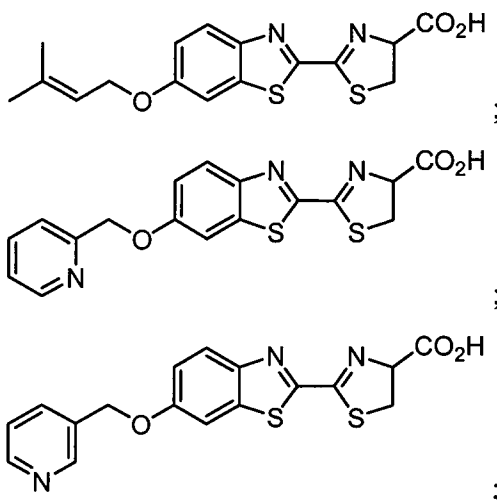


or a salt thereof.

211. (New) A kit for determining the effect of a substance on cytochrome P450 enzyme activity comprising:

(a) one or more luminogenic compounds, wherein the compound is a cytochrome P450 enzyme substrate and a pro-substrate of luciferase enzyme, and the compound is a selected from





or a salt thereof;

- (b) one or more bioluminescent enzymes;
- (c) a buffer; and
- (c) directions for using the kit.

212. (New) The kit according to claim 211 wherein the bioluminescent enzyme is a luciferase.

213. (New) The kit according to claim 211 wherein the bioluminescent enzyme is a firefly or a Renilla luciferase.

214. (New) The kit according to claim 211 further comprising ATP and magnesium ions.

215. (New) The kit according to claim 214 further comprising a detergent.

216. (New) The kit according to claim 215 wherein the detergent is non-ionic.

217. (New) The kit according to claim 215 further comprising a pyrophosphatase.

218. (New) The kit according to claim 217 wherein the pyrophosphatase is an inorganic pyrophosphatase.

219. (New) The kit according to claim 211, further comprising a reversible luciferase inhibitor.

220. (New) The kit according to claim 219, wherein the reversible luciferase inhibitor is 2-(4-aminophenyl)-6-methylbenzothiazole (APMBT) or 2-amino-4-methylbenzothiazole (AMBT).